THE AVIFAUNA OF THE LAKE ELLESMERE AREA, CANTERBURY

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ABSTRACT

The avifauna of the Lake Ellesmere area is described. A brief description of the area is given; past literature is reviewed; a checklist of birds, compiled from a variety of sources, is presented. For each species and subspecies (129 are listed), notes are given on status and the generalised vegetation zones or other habitat categories where it has been sighted or been found to breed.

In one census area, lake level has a pronounced affect on which species are present.

INTRODUCTION

The avifauna of Lake Ellesmere has attracted little serious attention by ornithologists although its importance as a habitat for waterfowl and many other marsh dwelling species has been long recognized. Furthermore, there is a paucity of information on the oceanic birds that occur on this part of the south Canterbury coastline.

The early literature, e.g., Potts (1882), made only incidental reference to the birds of this area. Stead (1923), as Sibson in Falla et al (1966) previously indicated, first described the presence of several species of migrants previously unrecorded in New Zealand. From 1900 to 1929 Stead, at Ellesmere, made the first New Zealand sightings of the little whimbrel (*Numenius minutus*), Hudsonian godwit (*Limosa haemastica*), red-necked phalarope (*Phalaropus lobatus*), curlew sandpiper (*Calidris ferruginea*), red-necked stint (*Calidris ruficollis*), pectoral sandpiper (*Calidris melanotus*) and sanderling (*Calidris alba*). Stead (1927, 1932) also investigated the status, abundance, breeding activities and ecology of other species. His publications provide a useful ornithological appraisal which permits comparisons with the present situation. Sibson (in Falla et al 1970) paid tribute to Stead's contributions to New Zealand ornithology, and, like Stidolph (1954), commented on the lack of attention the Ellesmere avifauna has received since Stead's investigations. This situation has recently been changed in specific instances by publications on, for example, the Canada goose (*Branta canadensis*), (Imber 1968, Imber and Williams 1968), and on the black swan (*Cygnus atratus*) (Miers and Williams 1969).

The most informative accounts of seabirds on this part of the coastline are Lindsay (1948), recording seabirds off Banks Peninsula, and Bull and Boeson (1963), and Boeson (1964, 1965) recording birds washed ashore on south Canterbury beaches. The scarcity of information of the occurrence of many oceanic birds on this coastline justifies their incorporation here, although

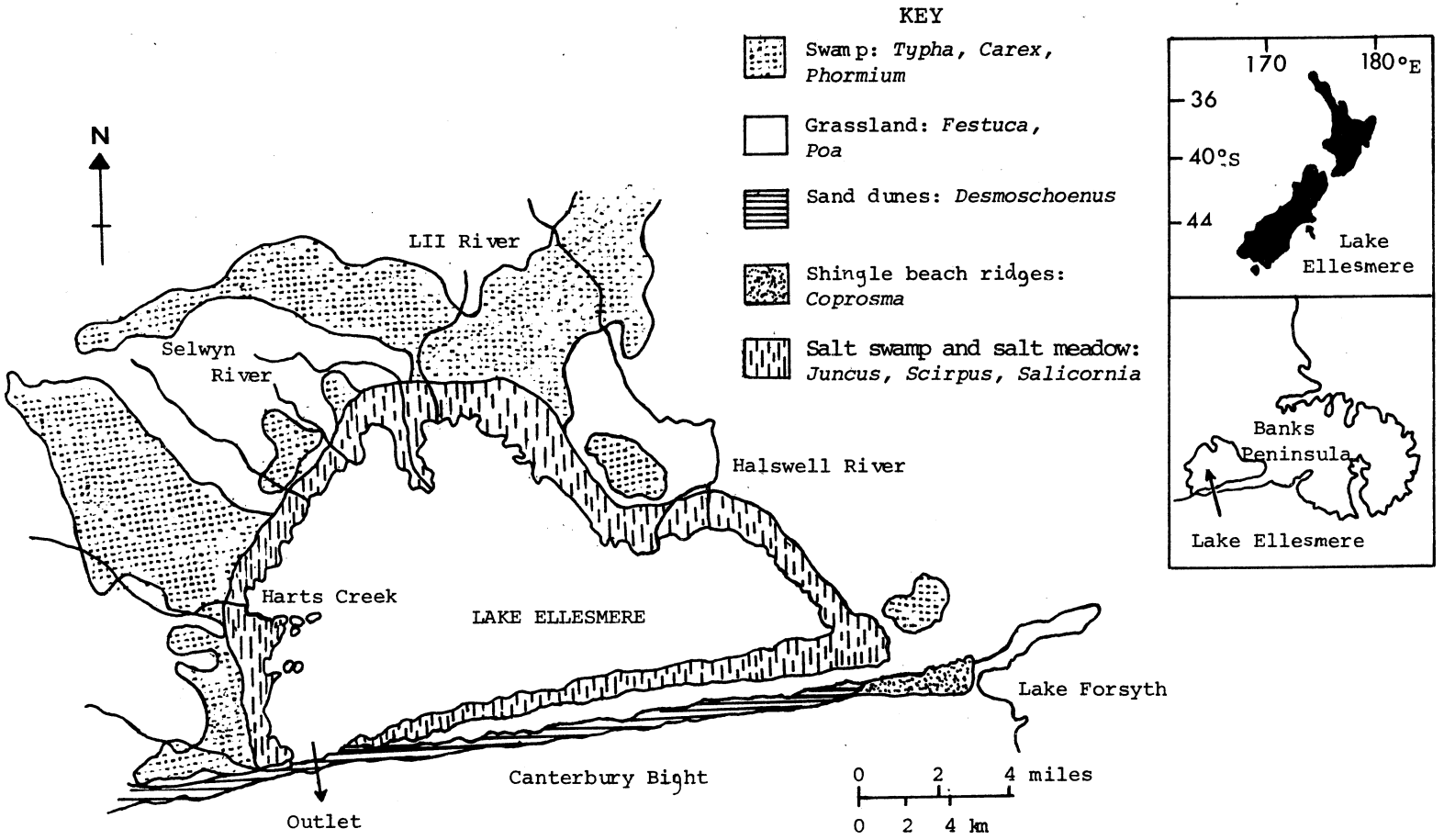

Fig. 1 Past vegetation distribution (after Burrows 1969)

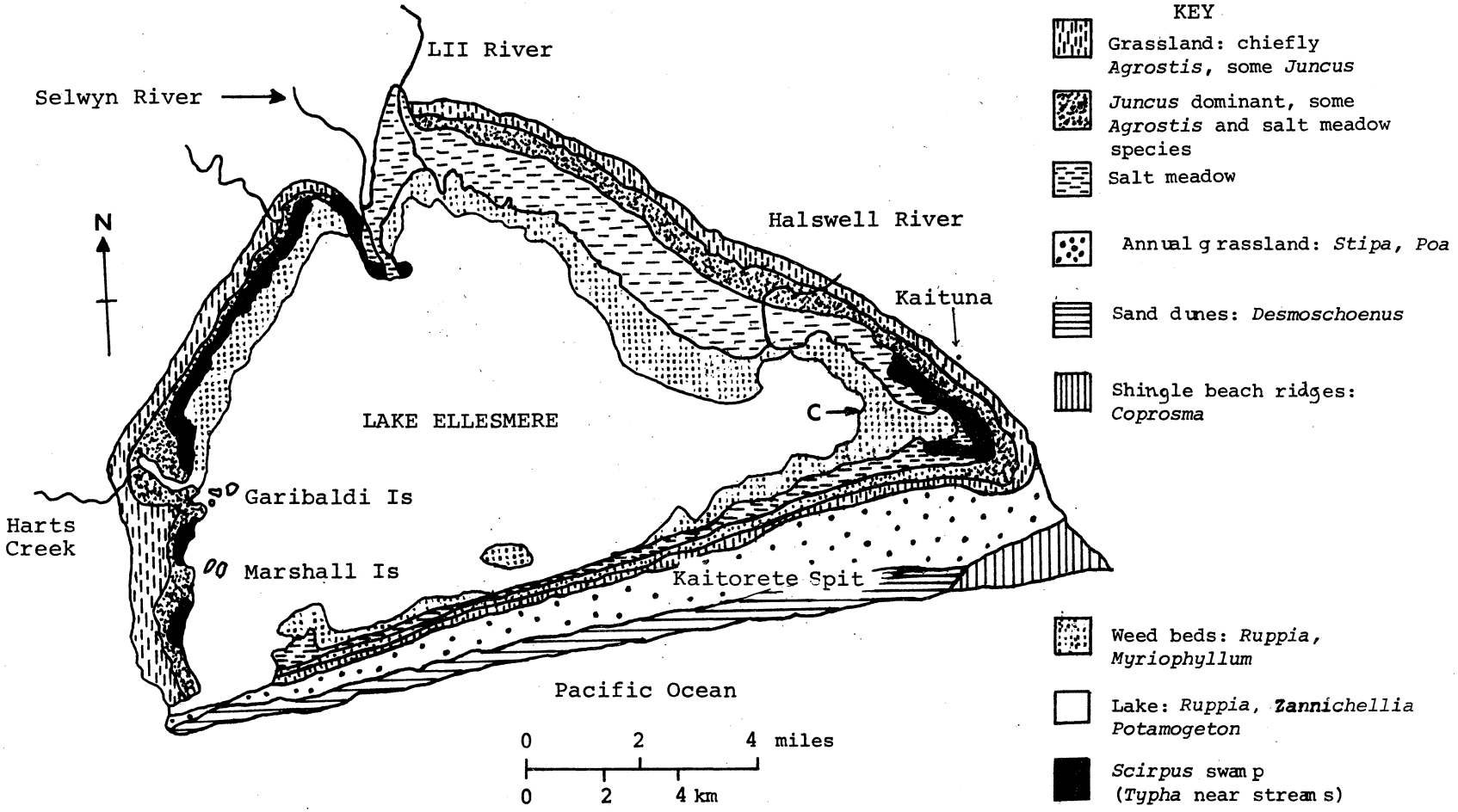

Fig. 2 Present vegetation distribution (after Burrows 1969)

it is possible that ocean surface currents (Speight 1930, Brodie 1960), have carried some specimens outside their usual range to be washed up on the Ellesmere coast. Most records of oceanic birds in this account are from dead specimens washed ashore on Kaitorete Spit.

The present investigation suggests the need for basic information on the status of the waders, and the ecological requirements of these and other species that occur on the Lake's fringe. Until these data are available it is difficult to assess whether the present lake levels are those that produce optimal conditions for birds that are dependant on the lake depth or birds that rely on the regular flooding and exposure (saturation) of the lake shoreline.

GENERAL FEATURES OF THE LAKE

The following description of general Lake features is largely drawn from an account by Burrows (1969).

Lake Ellesmere (172° 30'E, 45° 45'S), is brackish, and the fifth largest lake in New Zealand being about 26 km (16 miles) long with a maximum width of 13 km (8 miles). It is located south of Banks Peninsula at the north-eastern extremity of Canterbury Bight.

The Lake's waters are retained by shingle fans derived from the Waimakariri, Selwyn and Rakaia rivers, volcanic rocks of Banks Peninsula, and a shingle bar, Kaitorete Spit. About 641 km^2 (250 $miles^2$) of hill country and 1539 km^2 (600 $miles^2$) of plains drain into the Lake. The peripheral terrain is flat and low lying and much of the Lake's 58 km (36 mile), indented shoreline consists of sand and mudflat. At 0.6 m (2 feet) above mean sea level (m.s.l.) the Lake's area is 15 200 ha (38 000 acres) and, at 1.2 m (4 feet) above m.s.l., is 21 600 ha (54000 acres). About three quarters of the Lake bed is below m.s.l. The North Canterbury Catchment Board's present policy is to maintain the lake level at 1.05 m (3.45 feet) above m.s.l. from August to March inclusive, and 1.12 m (3.7 feet) above m.s.l. from April to July. In exceptional conditions, when the Lake outlet is blocked by shingle deposited by strong seas, the lake level may rise to 2.1 m (7 feet) above m.s.l.

As a result of windlash from the southwest, northwest, and northeast, in a few hours the water level may be raised on the leeward side by 0.6 m (2 feet). From 1953 to 1962 the North Canterbury Catchment Board (1962) recorded differences in water levels between the eastern and western side of the Lake, which during major storms ranged from 0.8 m (2.6 feet) to 1.5 m (5.1 feet).

There is sufficient ambient moisture to allow surrounding terrestrial plant growth throughout winter, but growth may cease during summer drought. The mean annual rainfall is 650 mm (26 inches), and the mean annual temperature is 11°C. The winters are cool with frequent frosts and occasional light snowfalls.

The ecology of the vegetation was comprehensively investigated by Evans (1953), who showed that the three main factors which influence the vegetation zones are flooding, salinity and

soil texture. There are no detailed ecological studies on the vegetation of Kaitorete Spit apart from a list of plants compiled by Speight (1930) although Wraight (1957, 1964) described the influence of stocking rates on the vegetation for this area. The location and extent of the 'weed beds', viz, *Ruppia spiralis* and *Myriophyllum elatinoides*, are given by Miers and Williams (1969).

The changes in the distribution of the past and present vegetation, shown in Figs 1 and 2, follow Burrows (1969). One conspicuous modification is the reduction of *Typha, Carex* and *Phormium* plant communities, which once extended well beyond their present limits on the Lake's western and northern boundaries. This reduction has probably resulted from drainage of wetlands and burning off in preparation for agriculture, a practice that is continuing, particularly on the western side of the Lake. Through the combined efforts of the North Canterbury Acclimatisation Society (hereinafter referred to as the N.C.A.S.), and the Wildlife Branch of the Department of Internal Affairs, many proposals formulated to drain the Lake have been curtailed. In 1958 the Department of Lands and Survey proposed to implement a scheme to reclaim about 2 400 ha (6 000 acres) of wet land between the LII River and the Halswell River but this proposal was not implemented because of the opposition raised by the Wildlife Branch and the N.C.A.S. (Lamb 1964).

DISCUSSION OF THE CHECKLIST

Accompanying the checklist (Appendix I) are notes on its compilation and interpretation. Presented in Appendix II are methods and results of a short term investigation on the influence of lake levels on the occurrence of birds at a selected locality (see Fig. 2) on the eastern side of the Lake.

STATUS

Of 129 birds listed in Appendix I, 53 are considered stragglers (5 of these are provisional records). The status of the remainder are as follows: 37 that breed in the area and are resident throughout the year; 12 migrants resident for the austral summer; 12 frequently reported but not recorded breeding; 4 unrecorded since the late 19 or early 20 th Century; 3 that are extinct; 3 local migrants that breed at Ellesmere then disperse; 2 non-local migrants that breed in the Lake area then disperse; 1 that is a straggler of a recent coloniser breeding elsewhere in New Zealand; 1 recently introduced species; and 1 recently present but now absent. Thirteen previously unrecorded species are listed; also included are 2 rare sightings, 5 provisional records and 1 doubtful record.

BIRDS PREVIOUSLY UNRECORDED

Birds recorded for the first time include a yellowlegs, (*Tringa* sp.) provisionally identified (Tunnicliffe 1964) as a lesser yellowlegs (*T. flavipes*); greenshank (*Tringa nebularia*); New Zealand dotterel (*Charadrius obscurus*); grey partridge (*Perdix perdix*), first liberated in Canterbury in 1961

(Williams 1969), cirl bunting (*Emberiza cirlus*), and the Australian coot (*Fulica atra*). Oceanic birds known to range offshore from Ellesmere, but for which there are no records on the coastline, include the erect-crested penguin (*Eudyptes pachyrhynchus*), rockhopper penguin (*Eudyptes crestatus*), southern blue penguin (*Eudyptula minor minor*), grey-headed mollymawk (*Diomedea chrysostoma*), Buller's mollymawk (*Diomedea bulleri*), light-mantled sooty albatross (*Phoebetria palpebrata*), grey-faced petrel (*Pterodroma macroptera*), Antarctic prion (*Pachyptila desolata desolata*), northern petrel (*Pelecanoides urinatrix*), little black shag (*Phalacrocorax sulcirostris*) and the gannet (*Sula bassana*).

RARE SIGHTINGS

Two species, the black stilt (*Himantopus novaezealandiae*) and the spur-winged plover (*Lobibyx novaehollandiae*) were observed at the LII River mouth. Since 1969, the latter species has rapidly increased its range around the Lake and is now resident and breeding (see checklist). The only previous record of the black stilt at Ellesmere is Oliver (1955), and of the spur-winged plover, O.S.N.Z., Inc. (1953a) 'Checklist of New Zealand Birds'.

PROVISIONAL RECORDS

The following birds were provisionally identified and should not be quoted as locality records until their presence has been verified: white-capped mollymawk (*Diomedea cauta*), flesh-footed shearwater (*Puffinus carneipes*), Japanese snipe (*Gallinago hardwicki*), lesser yellowlegs and the broad-billed sandpiper (*Limicola falcinellus*).

A DOUBTFUL RECORD

One specimen of a banded stilt (*Cladorhynchus leucocephalus*) was found in the Canterbury Museum's avian collection, and in the Museum catalogue its locality is given as Lake Ellesmere. This specimen belongs to the late A.C. O'Connor's collection, which was purchased by the Museum in 1942. In O'Connor's personal catalogue, and in his systematic list, the locality is given as Lake Ellesmere; the systematic entry, however, is followed by a question mark. Although the banded stilt is not listed in the "Annotated Checklist of the Birds of New Zealand . . ." (O.S.N.Z. 1970) (understandably so if the specimen described here is the only evidence of its occurrence in this country), Cayley (1961) described it as 'straggling to New Zealand'. It is perhaps interesting to speculate that, should this species cross the Tasman, then Lake Ellesmere would possibly provide a suitable habitat as Cayley (1961) mentions that the banded stilt's preference in Australia for salt lakes.

CHANGES IN AVIFAUNA

A comparison of the present avifauna with that described by Stead (1927) indicates that the most noticeable changes are the recent establishment of welcome swallow (*Hirundo tahitica*)

(Turbott 1965, Tunnicliffe 1968, Hughes 1973) and spur-winged plover. The disappearance of black-billed gull (*Larus bulleri*) breeding colonies on the Lake margins (Stead 1927) is noteworthy. It appears that the white-throated shag (*Phalacrocorax melanoleucos*), now resident and common, has in comparatively recent times reached this status; Stead (1927), over a period of 30 years, records only one sighting of an individual of this species. White-throated shags are often seen at numerous localities around the Lake, and have established a vigorous mating colony on an ox-bow lake about 1.6 km (1 mile) upstream from the Selwyn River mouth. There are two specimens of pied shag (*Phalacrocorax varius*) in the Canterbury Museum from Ellesmere, but these were probably stragglers as none were sighted by the author. Stead (1927), over a period of 35 years, never recorded this species at Ellesmere and attributed their disappearance to excessive shooting, although according to Potts, and Buller (cited by Stead 1932) pied shag did once occur on the Lake. It is interesting to note that Stead (1927) never recorded pied shag south of the Waimakariri as they now occasionally straggle to the Avon-Heathcote Estuary. Stead (1927) mentions the white heron (*Egretta alba*) as an occasional visitor; Andrew (1963) in June 1957 recorded 34 on Ellesmere. The white heron now occurs there annually, and during the period of the present study a flock of 14 was sighted at the LII River mouth.

The abundance of pied stilt (*Himantopus himantopus*), black swan and the few records of wrybill (*Anarhynchus frontalis*), and knot (*Calidris canutus*), and the present status of New Zealand scaup (*Aythya novaeseelandiae*) (occasionally reported on the Bromley sewage ponds west of the Avon-Heathcote Estuary), dabchick (*Podiceps rufopectus*) and crested grebe (*Podiceps cristatus*) closely parallels, for these species, the situation on the Lake described by Stead (1927).

The aforementioned remarks in this sub-section only deal with those few species where historical data are available, but, even with this information, the present inadequately described situation permits only a brief appraisal. In addition to the size of the Lake precluding comprehensive surveys, one disadvantage in interpreting past sight records is that some localities on the shoreline are more accessible than others hence rendering certain very localized species less amenable to observation. One suggestion for future workers who are recording sightings is to give grid references of where data are collected, which would enable information assembled over a period of time to be correlated with lake level, seasons and locality. The fluctuating water levels at Ellesmere do not daily compress the waders, for example, onto regular roosting areas as occurs with those species that occupy tidal mudflats. Consequently in the former situation accurate estimates of waders are more difficult to obtain.

POSSIBLE CAUSES OF CHANGES IN DUCK AND WADER NUMBERS

Explanations for the reduction in numbers, or disappearance, of certain waterfowl species, viz, grey duck (*Anas superciliosa*), brown duck (*Anas aucklandica*), on the Lake, and lower Canterbury

plains, given by Turbott (1969), (who indicated that there are probably other factors), include drainage, reduction in plant cover, shooting (which according to Potts (1873), was a popular past-time on the Lake in the late 19 th Century), and competition for food. Balham and Miers (1959) showed that the mallard (*Anas platyrhynchos*) is at a biological advantage compared with grey duck, as the latter is more readily attracted to shooter's decoys than mallard. Furthermore, Balham and Miers (1959) indicated that the abundance of mallard (which is very common at Ellesmere (Williams 1969)) relative to the scarcity of grey duck can be explained by the mallard's greater breeding potential, its ability to utilize a greater variety of habitats, and its capacity to cope more favourably with swampland drainage. Another threat to the pure grey duck's viability is the frequency of inter-breeding with mallard (Balham and Miers 1959). Out of a trapped sample of 1 334 ducks from Ellesmere by far the greatest proportion (90.6%) were mallard (see grey duck in Appendix I).

Stead (1927) reported a decline of godwit (*Limosa lapponica*) and knot on the Lake, and considered that this was partly brought about by shooting and the abundance of pied stilt which, he claimed, competed with godwit for food. Data cited by Stidolph (1954), from the Annual Reports of the N.C.A.S. indicate, however, that the shooting season on godwit did not always coincide with the peak occurrence of this species on the Lake, which possibly explains, at least from 1922 onwards, why few were shot. Although Stidolph (1954) lists Ellesmere as one of the principal haunts for godwit in New Zealand, and the 1939 Annual Report of the N.C.A.S. recorded that 'large numbers of this migrant were observed during December and January . . .' (cited by Stidolph 1954), there are insufficient recent data, as Stidolph (1954) has indicated, to comment on the size of the godwit population. Information on their numbers over the period in which they were classified as a gamebird is imprecise and hence the effect of shooting cannot be established.

POSSIBLE CAUSES OF CHANGES IN BLACK SWAN AND CANADA GOOSE NUMBERS

Perhaps the most spectacular avifaunal change on Ellesmere has been the relatively rapid build up in numbers and successful establishment of the black swan and Canada goose. The black swan, first liberated in Canterbury in 1864, were 'particularly numerous' and breeding on the Lake only three years later (Lamb 1964). In 1871 three hundred black swan were recorded at the mouth of the Halswell River and in 1875 the species was declared a gamebird (Lamb 1964).

According to Lamb (1964) the earliest reports of Canada geese breeding in Canterbury were around 1909, and by 1932 Canada geese were considered a pest by land-owners whose properties adjoined the Lake.

From data assembled by Imber and Williams (1968), it seems that even with an extended hunting season and no restriction on bag limit on Canada geese, the goose population was able, at least during the period of the previous investigation, to cope with these management practices. Imber and Williams (1968) believed that requests from farmers in 1967 for permits to scare geese off their properties and data from shooters' diaries

for the 1967 special season suggested that the goose population was not decreasing. That black swan and Canada geese have survived a steady increase in shooting pressure, as is apparent when one takes into account that in 1936 the N.C.A.S. sold 643 gamebird licences and in the 1968 season 2 847 were issued, suggests the vigorous utilisation of a previously unexploited food supply. Should the black swans' food supply become too deeply submerged by a high lake level, or depleted, as has happened from time to time (e.g., in the April 1968 storm (Bucknell 1969)), then the swans that lose condition may stop breeding, become diseased and/or even starve (Lamb 1964, Williams 1969, Bucknell 1969, Adams 1971).

In addition to an inadequate food supply the size of the Ellesmere swan population is apparently reduced by other factors as, according to Williams (1969), since 1959 their numbers steadily declined but the reasons for this drop are not known. Two obvious ways in which the swan population has been held in check have been by the removal of their eggs and, to a lesser extent, by shooting. Since 1915 the N.C.A.S. has collected black swan eggs as a measure of control of this species: Lamb (1964) records that in 1915, 500 dozen eggs were taken; Stead (1927) mentions that 30 000 eggs were removed in 1926, and Williams (1969) reports that 60 000 were taken in 1962, with an estimated 25 000 being left to hatch. The present policy of the N.C.A.S. is to restrict the number of cygnets that hatch to about 20 000 per year (Miers and Williams 1969). By comparison shooting pressure is probably less significant as a means of control as many shooters do not favour the swan as a gamebird and even allow them to swim with their duck decoys; this apparently encourages the attraction of other more sought after waterfowl. Another form of control is the shooting of black swans on drives; the annual totals of birds shot on these, according to field officers of the N.C.A.S., range from 3 to 4 thousand birds.

THE EFFECT OF LAKE LEVEL

On the basis of the present maintenance of the Lake at a level 1 m or so below that of pre-European and early European times (over the latter period Burrows (1969) has reported lake levels of about 3 m (10 feet) above sea level), it seems reasonable to postulate that there has been a decrease in the wetland habitat available to waterfowl and waders. Moreover, during this early period of higher lake levels, there was probably an extensive floodplain caused by seepage and overflow from the freshwater rivers which enter the Lake at localities further inland than occurs today. The tall vegetation on these floodplains (Fig. 1) more than likely provided an abundance of cover and nest sites which were less exposed to windlash and flooding. The significance of swamping of nests has already been described by Miers and Williams (1969) for black swan, and at certain exposed localities on the lake edge was found to be by far the most significant egg mortality factor for pukeko (Tunnicliffe, in preparation). Egg mortality from flooding of pukeko nests is comparatively low at localities which have a pronounced freshwater influence where the vegetation, for example *Carex secta, Typha muelleri* and *Juncus pallidus*, is tall and robust and the nest sites are more elevated than at localities where there is a pronounced brackish water

influence. In areas away from any predominant freshwater influence, *Scirpus americanus* is extensively used for nesting. This plant is shorter and less robust, usually providing less protection against flooding. Other birds whose nests were flooded were pipit (*Anthus novaeseelandiae*), skylark (*Alauda arvensis*), mallard, Canada goose, and pied stilt. Species whose nests were considered vulnerable to flooding were: white swan (*Cygnus olor*), Caspian tern (*Hydroprogne caspia*), black-backed gull (*Larus dominicanus*), marsh crake (*Porzana pusilla*) and possibly grey duck and banded dotterel (*Charadrius bicinctus*).

THE EFFECT OF PREDATORS

The influence of endemic and introduced predators (other than man) on the Ellesmere avifauna has not been investigated as a specific topic, although Fitzgerald (1964) provided information on the food habits of stoats (*Mustela ermina*) on Kaitorete Spit. A study of the contents of stoat dens by Fitzgerald (1964) revealed that skylark and banded dotterel are common food items; other birds identified in his investigation included house sparrow (*Passer domesticus*), greenfinch (*Chloris chloris*), goldfinch (*Carduelis arduelia*), redpoll (*Cardeulis flammea*), yellowhammer (*Emberiza citrinella*), starling (*Sturnis vulgaris*), pukeko (*Porphyrio porphyrio*), pied stilt and pipit. During the present investigation a stoat was sighted on Kaitorete Spit removing eggs from a pukeko nest. Lamb (1964) referred to the predatorial activities of ferrets (*Mustela pulorius*) on the Lake. Bull (1969) showed that ferrets and stoats occur at a number of localities around the Lake and recorded weasels (*Mustela nivalis*) at Leeston, 5.6 km (3.5 miles) west of Ellesmere. Lamb (1964) reported that duck eggs are taken by rats (*Rattus* sp.) and mentions the presence of rats on Garabaldi and other islands in the Lake. During the present investigation rats were sighted at Harts Creek and amongst raupo on the southeast corner of Ellesmere where a rat's nest containing young was located beneath the nest bowl of a pukeko brood nest, a structure in which pukeko brood their young (Tunnicliffe 1965). Observations of the distribution of mammalian predators suggested they are usually associated with dry shelter, e.g., they were numerous on the rocky railway embankment on the eastern side of the Lake and on the adjacent fringes. Bull (1969), writing on "The smaller placental mammals of Canterbury", indicated that cats (*Felis catus*), which during the present study were occasionally sighted on the sand dunes of Kaitorete Spit, and stoats and ferrets have had a serious effect on birdlife. With the decline of the rabbit (*Oryctolagus cuniculus*) sightings of which were made in the present study at a number of localities at Ellesmere, predation on game and native birds probably increased (Bull 1969).

At night I observed hedgehogs (*Erinaceus europaeus*) feeding on skylarks' eggs and several clutches of this species were destroyed in nests built where the lower margin of the 'annual' grasslands (*Stipa* and *Poa laevis*) merged with the uppermost limits of the *Agrostis stolonifera* grasslands.

Avian predators include the black-backed gull which preys on the eggs of black swan (also reported by Miers and Williams 1969), and on both the eggs and chicks of mallard and pukeko. This gull, moreover, is able, while in flight in strong wind

conditions, to snatch an egg from a nest. Pukeko also take eggs of the mallard. Both predators, however, only took duck eggs which had previously been exposed because the cover around the nest site had been flattened, for example, by strong winds, or because of the displacement of eggs from the nest bowl by flooding. The harrier hawk (*Circus approximans*) preys on waterfowl chicks rather than their eggs. My own field observations reveal that relentless efforts by hawks to puncture fresh eggs of mallard and pukeko are unsuccessful, and hawks make no attempt to fly off with an egg. Although pukeko are antagonistic towards hawks they are relatively passive to predation by the black-backed gull. Studies on the harrier hawk's food habits by Carroll (1968) and redhead (1968) support these observations in that neither worker recorded waterfowl eggshell in the material examined. Carroll (1968) described harrier hawks eating deserted Canada goose eggs and preying on unattended black-backed gull eggs, although, in the latter situation, it is presumed that 'only two of several harriers present' behaved in this way.

Mallard ducks which breed on pukeko nesting territories benefit by the presence of pukeko in that the latter are persistent in their attacks on hawks; under these circumstances the pukeko provides and effective interspecific cover defence. Pukeko are rarely seen to attack mallard ducklings; moreover, in all the observed instances, the ducklings escaped.

There is one record of a dead rat and a broken pied stilt's egg found alongside a pukeko nest during this investigation.

Another example of predation was the killing of a newly hatched pukeko chick by an eel (*Anguilla* sp.). Human interference was probably indirectly responsible for the death of this chick as the territory to which it belonged at the time I visited it, was flooded; chicks disturbed from the nest under these circumstances conceal themselves amongst the floating vegetation or debris which makes them vulnerable to predation by eels.

In a separate category is the possible significance of stock trampling on nests and eggs. The only example of this was when a horse trod on a nest of pukeko eggs. It seems that stock that graze on the *Scirpus americanus/Agrostis stolonifera* plant communities and on the zones of vegetation growing on lower ground on the Lake shore cause negligible damage to the eggs of ground nesting birds that use this vegetation for nest sites.

CONCLUSIONS AND SUGGESTIONS FOR FUTURE WORK ON LAKE ELLESMERE AVIFAUNA

Because of the importance that ornithologists attribute to Lake Ellesmere for waterfowl and waders it seems timely that, a list of the avifauna be compiled to assess this claim. The most detailed investigations are those published over the last five years on the introduced waterfowl. Probably because of their obvious economic importance these gamebirds have been given research priority to ensure that they are not being overexploited. Virtually all publications on species with no obvious economic status appear as short notes either of sightings of bird species not previously recorded on the Lake or on those that are of unusual occurrence there. With respect to this element of the

avifauna perhaps the greatest immediate need is for more systematic data on the status and ecology of waders. Such an appraisal should include both the local and non-local migrants. It should then be possible to comment with more confidence on the overall ornithological significance of the Lake and to compare it with localities elsewhere in New Zealand that are considered important to waders.

Diversity in species composition, however, should not be the only criterion in assessing the ornithological significance of wader habitats. Lake Ellesmere, for example, although probably more diverse in wader species than the Avon-Heathcote Estuary, attracts nowhere near the numbers of bar-tailed godwit or oystercatcher as the Avon-Heathcote Estuary. On the other hand the Lake regularly attracts certain wader species, for example, curlew sandpiper, Pacific golden plover (*Pluvialis dominica*) and turnstone (*Arenaria interpres*), which, although reported to reach New Zealand annually, tend according to the O.S.N.Z., Inc. (1970) 'Annotated Checklist. . .' to reoccur in this country in their biggest concentrations with some regularity at certain localities only.

In relation to those waders that, according to the O.S.N.Z., Inc. (1970) 'Annotated Checklist. . .', either occasionally straggle to New Zealand or regularly occur here but only in small numbers; viz, the little whimbrel, Siberian tattler (*Tringa brevipes*), sharp-tailed sandpiper (*Calidris acuminata*), pectoral sandpiper, red-necked stint and sanderling, some at least will probably be found to be more frequent in their occurrence and more common on the Lake than the limited data now available suggests.

Of the 44 Charadriiformes recorded on the New Zealand mainland in the O.S.N.Z., Inc. (1970) 'Annotated Checklist. . .', 26 have been reported at Ellesmere. It seems likely that at least seven of the eighteen waders listed in the O.S.N.Z., Inc. (1970) 'Annotated Checklist. . .' not yet reported from the Lake will be eventually recorded there. These include the terek sandpiper (*Xenus cinereus*), wandering tattler (*Tringa incana*), marsh sandpiper (*Tringa stagnatilis*), American whimbrel (*Numenius phaeopus hudsonicus*), Mongolian dotterel (*Charadrius mongolus*), grey plover (*Pluvialis squatarola*), and possibly the variable oystercatcher (*Haematopus unicolor*).

The O.S.N.Z., Inc. (1970) 'Annotated Checklist. . .' lists 6 waders that have been reported in this country only in the North Island; this probably reflects a greater effort in the field by North Island ornithologists, a number of whom have specialised on waders.

Two waders, the red-capped dotterel (*Charadrius alexandrinus*), and black-fronted dotterel (*Charadrius melanops*) known to breed in Canterbury have not been reported at Ellesmere. Of the three waders that rarely have been sighted in New Zealand viz, the Japanese snipe, western sandpiper (*Calidris mauri*) and broad-billed sandpiper, the first species has been provisionally reported at the Lake.

More data are needed on the significance of the Lake as a breeding habitat for banded dotterel in the Canterbury Province

to establish what proportion it represents of the remainder of the Province's dotterel population. The Lake may prove to be one of the main South Island localities for dotterels and possibly pied stilt and wrybill to assemble before dispersing to breed, or for congregating at the completion of the breeding season before their northern migrations.

Some emphasis has already been given to the lack of information available on waders at Ellesmere, but, as Sibson in Falla et al (1970) has commented, the same is true for many wader habitats on the eastern coast of the South Island. It is hoped, therefore, that in assessing the present proposals to reclaim parts of or modify the tidal flow of the Avon-Heathcote Estuary that Lake Ellesmere or other South Island wader habitats are not looked upon as alternative localities for bar-tailed godwit, South Island pied oystercatcher or the lesser known migrants. In relation to the first two waders it is likely that if the current proposals to alter the present conditions at the Estuary are implemented then the populations of both these waders must undergo some readjustment in numbers which will probably be to their detriment.

Species of birds in addition to those already mentioned in this discussion, occurring on the Lake in large numbers compared with populations of the same species at localities elsewhere in Canterbury include: white-throated shag, white-faced heron, white heron, bittern, white swan, grey teal, paradise duck (lowland Canterbury), pukeko, marsh crake, spur-winged plover, pied stilt, and probably black-billed and red-billed gulls (non-breeding birds), white-fronted tern, Caspian tern, skylark, pipit and welcome swallow.

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APPENDIX I

CHECKLIST OF THE BIRDS OF THE LAKE ELLESMERE REGION

KEY TO THE CHECKLIST

In the checklist that follows, each species or subspecies is listed under its family or subfamily. For most species data are given on reference sources, habitat, status, and for a few species recent data on their population size on Ellesmere.

The nomenclature follows O.S.N.Z., Inc. (1970) except for *Cladorhynchus leucocephalus* mentioned by Cayley (1961).

With the exception of data on spur-winged plover and welcome swallow most field observations were compiled between September 1966 and October 1968. This information was supplemented by personal communications, data from the literature, and from the Canterbury Museum's avian accession records. These sources have been abbreviated in the checklist as follows:

(i) C.M. indicates specimens found at Ellesmere and incorporated into the Canterbury Museum's avian collection. Within the square brackets that follow this abbreviation is the total number of specimens listed in the Museum's catalogue.

(ii) Italic numbers refer to volume numbers of *New Zealand Bird Notes* (now *Notornis*), followed by page number/s. The square brackets that follow these reference abbreviations show the number of birds recorded.

(iii) Lower case letters enclosed in parentheses indicate the following publications:
(a) = Falla, Sibson and Turbott 1966, 1970.

(b) = Oliver 1955
(c) = O.S.N.Z., Inc. 1953a.
(d) = O.S.N.Z., Inc. 1970.
(e) = Stead 1927.
(f) = Stead 1932.
(g) = Williams 1969.

(iv) Personal communications are acknowledged using the observers' initials given below. Inside the square brackets that follow these initials are the date/s when data were recorded and the number of birds counted.

B.D.B. = B.D. Bell
D.H.B. = D.H. Brathwaite
S.B. = S. Bucknell
M.M.D. = M.M. Davis
D.G.D. = D.G. Dawson
B.M.F. = B.M. Fitzgerald
L.H. = L. Henderson
M.J.I. = M.J. Imber
J.R.J. = J.R. Jackson
D.M. = D. Maindonald
C.D.R. = C.D. Roderick
S.S. = S. Sparrow
G.A.T. = G.A. Tunnicliffe

Frequency of Occurrence

The birds in the checklist are listed under their respective families or subfamilies in descending order of frequency of occurrence, using totals derived from the reference sources previously cited. The white-flippered penguin *Eudyptula albosignata* and sooty shearwater *Puffinus griseus*, for example, both of which nest on Banks Peninsula, head the list for their respective families. With the present information, however, for many species this method of tabulation does not necessarily imply an assessment of relative occurrence. The status of some species, particularly seabirds and waders, must be regarded as provisional, until more comprehensive details are available.

Habitat

The generalised vegetation and other zones where species were sighted, found dead, or recorded breeding, are listed in Table 1. Incorporated into the checklist are the habitat symbols shown in Table 1. Habitats used for breeding are suffixed by B.

TABLE 1. SYMBOLS FOR HABITAT CATEGORIES

Symbol	Definition
1	*Scirpus* swamp (*Typha* near steams).
2	Grassland (chiefly *Agrostis*, some *Juncus*).
3	*Juncus* dominant, some *Agrostis* and salt meadow species.
4	Salt meadow (*Hordeum* at higher levels, *Salicornia*, *Cotula* and *Lilaeopsis* at lower levels).
5	Annual grassland (*Stipa* and *Poa laevis* prominent).
6	Sand dunes (*Desmoschoenus*).
7	Shingle beach ridges.
8	Lake (*Ruppia*, *Zannichellia*, *Potamogeton*).
9	Trees, shelter belts, and scrub.
10	Oceanic.

CHECKLIST

Provisional identifications are indicated by an asterisk.

Anomalopterygidae (moa)

Anomalopteryginae

1. *Pachyornis elephantopus* (moa)
Source: C.M., [2]. Status: Extinct. Habitat ?

Emeinae

2. *Zelornis haasti* (moa)
Source: C.M., [2]. Status: Extinct. Habitat ?

Spheniscidae (penguins)

3. *Eudyptula albosignata* (white-flippered penguin).
Source: C.M., [7]; *3*:26-27; *12*:169-175, [4]; B.M.F., [5 Feb. 1963:1]; M.M.D., [13 Mar. 1963:2]. Status: Breeding on Banks Peninsula. Habitat 7. 10.

4. *Megadyptes antipodes* (yellow-eyed penguin).
Source: C.M., [3]; *10*:404-411 and *12*:169-175, [total, 4].
Status: Recently reported breeding on Banks Peninsula by Harrow (1971).

5. *Eudyptes pachyrhynchus sclateri* (erect-crested penguin).
Source: C.M., [4]. Status: Straggler. Habitat 7. 10.

6. *Eudyptula minor minor* (southern blue penguin).
Source: C.M., [2]. Status: Straggler. Habitat 7. 10.

7. *Eudyptes crestatus* (rockhopper penguin).
Source: C.M., [1]. Status: Straggler. Habitat 7. 10.

Podicipedidae (grebes)

8. *Podiceps cristatus* (southern crested grebe).
Source: (f); *18*:3-29, [2]. Status: Straggler. The only evidence that this species was once resident on the Lake is based on Stead's statement (1927:214), "The Great Crested Grebe (*Podiceps cristatus*), though gone from Lake Ellesmere, may still be seen in pairs on most of the suitable lakes in the back country. . ." Habitat 8.

9. *Podiceps rufopectus* (New Zealand dabchick).
Source: C.M., [1]. Status: Now absent. Habitat 8.

Diomedeidae (albatrosses and mollymawks)

10. *Diomedea exulans* (wandering albatross).
Source: C.M., [2]; *8*:203, [1]. Status: Straggler.
Habitat 7. 10.

11. *Diomedea chrysostoma* (grey-headed mollymawk).
Source: C.M., [1]. Status: Straggler. Habitat 7. 10.

12. *Phoebetria palpebrata* (light-mantled sooty albatross).
Source: C.M., [1]. Status: Straggler. Habitat 7. 10.

13. *Diomedea melanophris* (black-browed mollymawk).
Source: *6*:86, [1]. Status: Straggler. Habitat 7. 10.

14. *Diomedea bulleri* (Buller's mollymawk).
Source: D.H.B., [Oct. 1969:1]. Status: Straggler.
Habitat 7. 10.

15. *Diomedea cauta* (white-capped mollymawk).
Source: *3*:26-27, [8]. Status: Provisional record (straggler).
Habitat 7. 10.

Procellariidae (petrels, shearwaters and fulmars)

16. *Puffinus griseus* (sooty shearwater).
Source: C.M., [14]; *3*:26-27, [9]; *10*:265-277, [100]; *10*:404-411 and *12*:169-175, [27]; B.M.F., [27 Nov. 1962:14; 16 Jan. 1963:5; 5 Feb. 1963:3; 23 Feb. 1963:1]; J.R.J., [9 Mar. 1963:1; 21 April 1963:1]; M.M.D., [13 Mar. 1963:1].
Status: Transient migrant but also breeding on Banks Peninsula.
Habitat 7. 10.

17. *Pachyptila vittata* (broad-billed prion).
Source: C.M., [2]; *12*:169-175, [14]; B.M.F., [16 Jan. 1963:8; 5 Feb. 1963:4; 23 Feb. 1963:2]; G.A.T., [27 Oct. 1969:1].
Status: Irregular in occurrence. Habitat 7. 10.

18. *Puffinus tenuirostris* (short-tailed shearwater).
Source: C.M., [2]; *10:*404-411 and *12:*169-175, [total, 2]; D.G.D., [23 Dec. 1962:1]; B.M.F., [16 Jan. 1963:1]; M.J.I., [22 Oct. 1968:6]. Status: Transient migrant (autumn and summer). Habitat 7. 10.

19. *Puffinus bulleri* (Buller's shearwater).
Source: *12:*169-175, [5]; B.M.F., [5 Feb. 1963:3; 23 Feb. 1963:2]. Status: Straggler. Habitat 7. 10.

20. *Puffinus gavia* (fluttering shearwater).
Source: C.M., [1]; *3:*26-27, [20]; *10:*404-411 and *12:*169-175, [total, 3]; B.M.F., [16 Jan. 1963:1]. Status: Straggler. Habitat 7. 10.

21. *Macronectes giganteus* (giant petrel).
Source: C.M., [1]; *3:*26-27, [2]; *12:*169-175, [1]; B.M.F., [16 Jan. 1963:1]. Status: Straggler. Habitat 7. 10.

22. *Daption capensis* (cape pigeon).
Source: C.M., [1]; *12:*169-175, [1]; M.M.D., [13 Mar. 1963:1]; M.J.I., [22 Oct. 1968:1]. Status: Straggler. Habitat 7. 10.

23. *Pachyptila turtur* (fairy prion).
Source: C.M., [1]; *12:*169-175, [2]; M.M.D., [23 Mar. 1963:1]. Status: Straggler (breeding on Banks Peninsula). Habitat 7. 10.

24. *Puffinus huttoni* (Hutton's shearwater).
Source: *12:*169-175, [3]; B.M.F., [5 Feb. 1963:1; 23 Feb. 1963:1]; M.M.D., [13 Mar. 1968:1]. Status: Straggler. Habitat 7. 10.

25. *Puffinus carneipes* (flesh-footed shearwater).
Source: *3:*26-27, [3]. Status: Provisional record (straggler). Habitat 7. 10.

26. *Pachyptila desolata desolata* (Antarctic prion).
Source: M.J.I., [22 Oct. 1968:1]. Status: Straggler. Habitat 7. 10.

27. *Pterodroma macroptera* (grey-faced petrel).
Source: C.M., [1]. Status: Straggler. Habitat 7. 10.

28. *Procellaria aequinoctialis* (white-chinned petrel).
Source: *10:*265-277, [1]. Status: Straggler. Habitat 7. 10.

Pelecanoididae (diving petrels)

29. *Pelecanoides urinatrix* (northern diving petrel).
Source: C.M., [2]. Status: Straggler. Habitat 7. 10.

Sulidae (gannets and boobies)

30. *Sula bassana* (Australian gannet).
Source: *9:*236-254; G.A.T., [10 Jan. 1967:1]. Status: Straggler. Habitat 7. 10.

Phalacrocoracidae (cormorants or shags)

31. *Stictocarbo punctatus* (spotted shag).
Source: M.J.I., [22 Oct. 1968:4]; Supplement to *Notornis 19:*21. Status: Common offshore from Kaitorete Spit. Nests on cliffs near base of Spit. Roosts on Lake edge during and after severe storms. Habitat 1. 7. 8. 10.

32. *Phalacrocorax melanoleucos* (white-throated (little) shag).
Source: (e). Status: Resident and breeding. Largest nesting colony in dead willows and in live trees alongside an ox-bow lake near the Selwyn River 2 km (1 1/4 miles) from the Lake edge. Habitat 1. 4. 7. 8.

33. *Phalacrocorax carbo* (black shag).
Source: (e) and (f). Status: Resident. Closest breeding colony on cliffs near base of Spit. Habitat 1. 7. 8. 9.

34. *Phalacrocorax varius* (pied shag).
Source: C.M., [2]. Status: Straggler. None sighted on the Lake throughout this investigation. Habitat 8?

35. *Phalacrocorax sulcirostris* (little black shag).
Source: J.R.J., [21 April 1963: 1]. Status: One record of a beach wrecked specimen on Kaitorete Spit.

Ardeidae (herons, egrets and bitterns)

36. *Ardea novaeholandiae* (white-faced heron).
Source: G.A.T. Status: Commonly sighted on the Lake shoreline throughout this investigation, particularly on less exposed localities with a freshwater influence. Status: Resident and breeding. Habitat 1. 2. 3. 4. 8.

37. *Egretta alba* (white heron).
Source: C.M., [5]; (f); *10*:311-315, [34]; G.A.T., [17 April 1967: 14]. Status: Seasonal visitor - autumn and winter. Habitat 1. 8.

38. *Botaurus stellaris* (Australian bittern).
Source: G.A.T., [10 June 1967: 11]. Status: Resident. Occasional sightings, particularly at the L II River mouth and on the western side of the Lake. Habitat 1.

39. *Nycticorax caledonicus* (Nankeen night heron).
Source: C.M., [1]; (b). Status: Straggler. Habitat ?

40. *Bubulcus ibis* (cattle egret).
Source: *10*:383-385, [1]. Status: Straggler. Habitat ?

Threskiornithidae (ibises and spoonbills)

41. *Platalea leucorodia* (royal spoonbill).
Source: (b). Status: Straggler. Habitat 8?

42. *Plegadis falcinellus* (glossy ibis).
Source: *13*:169, [1]. Status: Straggler. Habitat 1. 8?

43. *Threskiornis molucca* (Australian white ibis).
Source: C.M., [1]. Status: Straggler. Habitat 1. 8?

Anatidae (swans, geese and ducks)

Anserinae (swans and geese)

44. *Cygnus atratus* (black swan).
Source: (g); Cutten (1966); Miers and Williams (1969); Adams (1971). Status: Resident and breeding. Many black swans move out to sea offshore from Kaitorete Spit during the gamebird shooting season. Total population on the Lake, 22 400 (Bucknell, 1969: 52). Prior to the previous census black swan were possibly more abundant (Bucknell 1969) as indicated by Lamb (1964) who recorded a population of 70 000. Habitat 1B. 2B. 3B. 4B. 5B. 8B. 10.

45. *Branta canadensis* (Canada goose)*
Source: (g); Imber and Williams (1968); Imber (1968, 1969, 1970). Status: Largely migratory [3 500 to 5 000 moult on the Lake each year (M.J.I., pers. comm.)]; a few pairs remain to breed on the Lake. Nests have been located by the author between the dunes and Lake shoreline on Kaitorete Spit, Harts Creek and Sedgemere shoreline, and on the western side of the L II River mouth. Habitat 1B. 2B. 4. 5B. 6B. 7. 8. 10.

*Predominantly *Branta canadensis maxima* [see Imber (1970, 1971), and Yocom (1970)].

46. *Cygnus olor* (mute swan).
Source: (g); *19*:30. Status: Resident and breeding. Largest nesting colony on the Lake (and in New Zealand) located at and in the vicinity of the Harts Creek mouth. A few pairs nest elsewhere, for example, the L II River mouth and south east corner of the Lake. Nests usually built in tall cover (for example *Typha muelleri*; *Juncus pallidus*). Estimates on population size range from c200 (Lamb 1964) to 400 (Supplement to *Notornis 19*). Habitat 1B. 8.

47. *Cygnus sumnerensis* (extinct swan).
Source: C.M., [1]. Status: Extinct.

Anatinae (ducks)

48. *Anas platyrhynchos* (mallard).
Source: (g). Status: Resident and breeding. Move out to sea during the gamebird shooting season returning to feed on the Lake at night (Williams 1969). Habitat 1B. 2. 3. 4. 8B. 9B. 10. Occasionally lays in black swan nests.

49. *Anas superciliosa* (grey duck).
Source: S.B.; G.A.T. Status: Resident and breeding. Of 1 472 ducks trapped at Harts Creek in Feb. 1967, 1968 and 1969, 1 334 (90.6%) were mallard, 96 (6.5%) grey duck, and 42 (2.9%) were mallard/grey duck crosses (S.B., pers. comm.). Habitat 1. 8.

50. *Anas rhynchotis* (New Zealand shoveler).
Status: Resident and breeding but few nests reported. Nesting under gorse on dry ground alongside drains (D.M.). Habitat 1. 2. 8. 9B.

51. *Tadorna variegata* (paradise duck).
Source: G.A.T. Status: Resident but nowhere is it common. Tendency to depart from the Lake in the duck shooting season. Not reported breeding. Habitat 1. 2. 4. 8.

52. *Anas gibberifrons* (grey teal).
Source: C.M., [14]; G.A.T. Status: Occasional flocks but not reported breeding. Habitat 8.

53. *Anser anser* (feral domestic goose).
Source: G.A.T. [Nov. 1969: 21]. Status: Small nesting population at Harts Creek (nests located in *Leptocarpus simplex*) but occasional pairs nesting elsewhere on the Lake. Habitat 1. 3B. 8.

Note: In the 1968-69 breeding season there was a successful mating of a feral goose with a Canada goose, and two matings the following season (S.B., pers. comm.).

54. *Aythya novaeseelandiae* (New Zealand scaup).
Source: C.M., [1]; (f). Status: Straggler. Habitat 8?

55. *Aythya australis* (Australian white-eyed duck).
Source: C.M., [1]. Status: Straggler. Habitat 8?

56. *Anas aucklandica* (brown teal).
Source: C.M., [11]. Status: Now absent from Lake. Habitat 1? 8?

Accipitridae (harriers, etc.)

Circinae (harriers)

57. *Circus approximans* (Australian harrier).
Source: G.A.T. Status: Resident probably breeding but no nests located on Lake shoreline. Habitat 1. 2. 3. 4. 5. 6. 7. 8. 9.

Falconidae (falcons)

58. *Falco novaeseelandiae* (New Zealand falcon).
Source: C.M., [1]. Status: Now absent from Lake. Habitat 1?

Phasianidae (pheasants, etc.)

Perdicinae (partridges and quails)

59. *Lophortyx californica* (Californian quail).
Source: G.A.T. Status: Resident and breeding; all sightings on western side of the Lake behind Sedgemere shoreline. Habitat 9.

60. *Perdix perdix* (grey partridge).
Source: G.A.T. Status: Occasional sightings on eastern and western side of the Lake. Most sightings behind Sedgemere shoreline. Habitat 9.

Phasianinae (pheasants)

61. *Phasianus colchicus* (pheasant).
Source: G.A.T. Status: Resident and breeding; all sightings behind Sedgemere shoreline. Habitat 9.

Rallidae (rails, crakes and waterhens)

62. *Porphyrio porphyrio* (pukeko).
Source: Tunnicliffe (1965); *13*:133-141; *15*:23-30; *16*:101-120. Status: Resident and breeding. Regular counts by the author at localities influenced by the fluctuations in Lake level indicate that the total pukeko population approximates but does not exceed 2 000. On a 1967 survey at six unnamed localities on the Lake, Carroll (1969) records 3 600 pukeko. Habitat 1B. 2B. 3B. 4. 8B. Occasionally lays in black swan nests.

63. *Porzana pusilla* (marsh crake).
Source: G.A.T.; *19*:43. Status: Occasional sightings and probably breeding. Recorded at Harts Creek in *Typha muelleri*; L II River mouth in mixed stands of *Juncus pallidus* and *Scirpus caldwelliae* and at Kaituna on islets of mixed stands of *Scirpus caldwelliae* and *Scirpus americanus*. Habitat 1.

64. *Fulica atra* (Australian coot).
Source: C.M., [3]. Status: Straggler. Habitat 8?

Haematopodidae (oystercatchers)

65. *Haematopus ostralegus* (South Island pied oystercatcher).
Source: G.A.T., [6 Dec. 1967: 14]; L.H. and M.M.D., [25 Oct. 1969: 10]. Status: Occasional small parties. Habitat 4. 8.

Charadriidae (plovers)

Vanellinae (lapwings)

66. *Lobibyx novaehollandiae* (spur-winged plover).
Source: C.M., [3]; (b); G.A.T., [Nov. 1965: 2; Dec. 1967: 2]; M.M.D., [Sept. 1969: 15]; L.H. and M.M.D., [25 Oct. 1969: 4 adults and 3 juveniles]. Status: Since 1969 this species has rapidly expanded its range around the Lake; first recorded nesting in the 1969/70 breeding season near the Halswell River mouth. Now breeding at several localities. From 1965 to 1969 occasional sightings only. Not reported on Kaitorete Spit. Habitat 2B. 3.

Charadriinae (true plovers)

67. *Charadrius bicinctus* (banded dotterel).
Source: *9*:242, [1 000]; *19*:48; L.H. and M.M.D., [25 Oct. 1961: 13]; G.A.T., [27 Oct. 1969: c250 - one count, Kaitorete Spit]. Common on Kaitorete Spit throughout the breeding season. Regularly sighted on squat salt marsh vegetation. Status: Resident but also probably occurring as a transient migrant. Habitat 2. 4. 5B. 6B. 7. 8.

68. *Pluvialis dominica* (Pacific golden plover).
Source: C.M., [4]; (b); *9*:242, [85]; B.D.B., [Feb. 1964, three counts: 1; 2; 16]; *19*:352, [2]; L.H. and M.M.D., [25 Oct. 1969: 51]. Status: Regular migrant. Habitat 3. 8.

69. *Anarhynchus frontalis* (wrybill).
Source: C.M., [1]; (f); B.D.B. [Feb. 1964, three counts: 1; 2; 16]; L.H. and M.M.D., [25 Oct. 1969: 37]. Status: Transient (local) migrant. Habitat 3. 8.

70. *Charadrius obscurus* (New Zealand dotterel).
Source: L.H. and M.M.D., [25 Oct. 1969: 1]. Status: One record. Habitat 3.

Scolopacidae (curlew, snipe and sandpiper)

Tringinae (curlews, godwits, etc.)

71. *Limosa haemastica* (American black-tailed (Hudsonian) godwit).
Source: C.M., [8]; (a); (b); (e); *5*:94, 1953b, [1]; *6*:31-39; *19*:51, [1]. Status: Possibly a regular migrant. Habitat 4. 8.

72. *Numenius minutus* (little whimbrel).
Source: C.M., [6]; (b); (e); *19*:354 [2]. Status: Occasional migrant. Habitat 4.

73. *Limosa lapponica* (eastern bar-tailed godwit).
Source: C.M., [2]; (e); (f); G.A.T., [27 Oct. 1969: 8]. Status: Migrant. Habitat 4. 8.

74. *Numenius madagascariensis* (long-billed curlew).
Source: C.M., [2]. Status: Straggler but may be more regular than available data suggests. Habitat 4.8.

75. *Tringa flavipes* (lesser yellowlegs).
Source: (a); *11*:103-104, [1]. Status: Provisional record (straggler, one record but see text). Habitat 3.

76. *Tringa nebularia* (greenshank).
Source: (a); G.A.T. and M.M.D., [Jan. 1967: 2]; M.J.I., [9 Jan. 1968: 2]; G.A.T., [11 Dec. 1969: 2]. Status: Recent sightings suggest this species is a regular migrant. Habitat 4. 8.

77. *Numenius phaeopus* (Asiatic whimbrel).
Source: C.M., [1]. Status: Straggler but may be more regular than the present data indicates. Habitat 4. 8.

78. *Tringa brevipes* (Siberian tattler).
Source: *9*:243, [1]; (a); (c). Status: Straggler. Habitat 4. 8.

Arenariinae (turnstones)

79. *Arenaria interpres* (turnstone).
Source: C.M., [8]; (b); *9*:234, [c100]; *19*:355, [14]; B.D.B., [Feb. 1964, three counts: 6 plus; 0; 0]; L.H. and M.M.D., [25 Oct. 1969: 29]. Status: Migrant. Habitat 4.

Scolopacinae

80. *Gallinago hardwicki* (Japanese snipe).
Source: C.D.R., [Feb. 1961: 1]. Status: Provisional record. Habitat 4?

Calidrinae

81. *Calidris ferruginea* (curlew sandpiper).
Source: C.M., [15]; (a); (b); (c); (e); *19*:53, [2]; *19*:356, [25; 3]; B.D.B., [Feb. 1964, three counts: 0; 0; 27]; G.A.T., [27 Oct. 1969: 73]. Status: Migrant, frequently sighted on Lake shoreline on Kaitorete Spit. Habitat 4.

82. *Calidris ruficollis* (red-necked stint).
Source: C.M., [14]; (a); (b); (c); *19*:53, [33]; *19*:356, [24]; G.A.T., [27 Oct. 1969; 3]. Status: Migrant. Frequent sightings on Lake shoreline at base of Kaitorete Spit. Habitat 3. 4.

83. *Calidris acuminata* (sharp-tailed sandpiper).
Source: C.M., [11]; (a); (b); (e); *19*:53, [12]; *19*:355, [2]; L.H. and M.M.D., [25 Oct. 1969: 1]. Status: Regular sightings. Habitat 3. 4. 8.

84. *Calidris melanotos* (pectoral sandpiper).
Source: C.M., [8]; (b); (e); *19*:53, [2]. Status: Regular sightings. Habitat 3. 8.

85. *Calidris canutus* (eastern knot).
Source: C.M., [5]; (b); (e); (f); *5*:94, 1953b, [7]; *9*:243, [6]; G.A.T., [27 Oct. 1969: 9]. Status: Migrant. Habitat 3. 4. 8.

86. *Calidris alba* (sanderling).
Source: C.M., [1]; (a); (e); *9*:243, [1]; *19*:356, [1]. Status: Occasional sightings. Habitat 4. 8?

87. *Limicola falcinellus* (broad-billed sandpiper).
Source: D.H.B., [Dec. 1962:1]. Status: Provisional record (straggler). Habitat 4?

Recurvirostridae (stilts and avocets)

88. *Himantopus himantopus* (pied stilt).
Source: (f); *19*:54; L.H. and M.M.D., [25 Oct. 1969: 38]. Status: Nesting in isolated pairs or small colonies of several pairs on, for example, the Kaituna shoreline and near the L II River mouth. Habitat 1. 2B. 4. 7.

89. *Recurvirostra novaehollandiae* (Australian avocet).
Source: C.M., [1]; (a); (e). Status: Straggler. Habitat 3?

90. *Himantopus novaezealandiae* (black stilt).
Source: (d); G.A.T., [7 Mar. 1967:2]. Status: Rare (straggler). Habitat 3. 4.

91. *Cladorhynchus leucocephalus* (banded stilt).
Source: C.M., [1]: (a). Status: Doubtful record. Habitat ?

Phalaropodidae (phalaropes)

92. *Phalaropus fulicarius* (grey phalarope).
Source: C.M., [1]; (a); (b). Status: Straggler. Habitat ?

93. *Phalaropus lobatus* (red-necked phalarope).
Source: (a); (b); (c). Status: Straggler. Habitat ?

Stercorariidae (skuas)

94. *Stercorarius skua* (southern skua).
Source: (f); M.J.I., [7 Jan. 1967: 1]. Status: Straggler. Habitat 7. 10.

Laridae (gulls and terns)

95. *Larus dominicanus* (southern black-backed gull).
Source: G.A.T. Status: Resident, breeding on Kaitorete Spit and along coastline on top of and on coastal side of sand dunes. Nest among black swan colonies on Spit. Occasional pairs nesting elsewhere, e.g. Kaituna Lake edge. Habitat 1B. 2. 3. 4B. 5B. 6B. 7B. 10.

96. *Larus bulleri* (black-billed gull).
Source: (e); (f); *3*:36-37; *6*:86-108. Status: Recorded breeding on the lake shores by Stead (1932), but not during this investigation. Habitat 1. 7. 8.

97. *Larus novaehollandiae* (red-billed gull).
Source: (f); *12*:223-240. Status: Recorded breeding by Gurr and Kinsky (1965), but not during this investigation. Habitat 1. 2. 3. 4. 6. 7B. 8.

Sternidae

98. *Sterna striata* (white-fronted tern).
Source: *3*:26-27; *6*:86-108; *7*:65-69; B.M.F., [23 Feb. 1963: 1]; J.R.J., [9 Mar. 1963: 3]. Status: Resident throughout breeding season. In 1954, an estimated 1 500 pairs nested in a colony observed by Clark and Dawson (1957). In 1954 the same workers ringed 447 white-fronted tern chicks at Ellesmere: six of these were recovered the following winter on the New South Wales coast. Habitat 7B. 8. 10.

99. *Hydroprogne caspia* (caspian tern).
Source: G.A.T. Status: Breeding (usually isolated pairs) on the Kaitorete Spit coast and Lake shore (amongst *Scirpus americanus*) and on the Marshall Islands offshore from the western side of the Lake. These observations on breeding extend the nesting habitat, viz. riverbeds, mentioned for this species in Canterbury by Turbott (1969). Habitat 1B. 6B. 7. 8. 10.

100. *Chlidonias hybrida* (black-fronted tern).
Source: G.A.T., D.H.B., [spring 1960: 1]. Occasional sightings along coastline. Habitat 6. 7. 8. 10.

101. *Chlidonias leucopterus* (white-winged black tern).
Source: (b); (c); *19*:357, [1]; D.H.B. (Several sightings).
Status: Straggler. Habitat 7. 10.

102. *Sterna nereis* (fairy tern).
Source: (b). Status: Straggler. Habitat 7. 10.

103. *Sterna albifrons* (little tern).
Source: (a); M.J.I., [5 Jan. 1967: 5]; G.A.T., [27 Feb. 1968: 7]. Status: Straggler. Habitat 7. 10.

Columbidae (pigeons and doves)

Columbinae (pigeons and doves)

104. *Columba livia* (rock pigeon).
Source: G.A.T. Status: Commonly seen flying across Lake, sometimes feeding on Lake shore. Breeding on Banks Peninsula. Habitat 4.

Treroninae (fruit pigeons)

105. *Hemiphaga novaeseelandiae* (New Zealand pigeon).
Source: G.A.T., [27 Nov. 1967: 1]. Status: Straggler. Breeding on Banks Peninsula. Habitat 9.

Cuculidae (cuckoos)

106. *Chalcites lucidus* (shining cuckoo).
Source: C.M., [1]; G.A.T., [Dec. 1966: 1; Jan. 1967: 1; Dec. 1967: 1; Dec. 1968: 2]. Status: Migrant. Habitat 9.

107. *Eudynamis taitensis* (long-tailed cuckoo).
Source: C.M., [1]. Status: One record. Habitat 9?

Strigidae (owls)

Striginae (owls)

108. *Athene noctua* (little owl).
Source: G.A.T. Status: Resident and breeding. Nest sites include hollows in willows (Harts Creek and L II River) and holes in loess bluffs on eastern side of the Lake. Habitat 9.

Alcedinidae (kingfishers)

Daceloninae (forest kingfisher)

109. *Halcyon sancta* (kingfisher).
Source: G.A.T., *19*:71. Status: Resident and probably breeding. Habitat 9.

Alaudidae (larks)

110. *Alauda arvensis* (skylark).
Source: G.A.T. Status: Resident and breeding. Nesting in *Agrostis stolonifera* and *Scirpus americanus* and in vegetation on more elevated ground around the Lake. Habitat 2B. 3B. 4. 5. 6.

Hirundinidae (swallows)

Hirundininae (true swallows)

111. *Hirundo tahitica* (welcome swallow).
Source: *12*:241-244; *15*:288-333. Status: Resident and breeding. Since 1968 this species has continued to expand its range around the Lake. Habitat 1. 2B. 4. 5. 8.

Motacillidae (wagtails and pipits)

112. *Anthus novaeseelandiae* (New Zealand pipit).
Source: G.A.T. Status: Resident and breeding. Habitat 1B. 2B. 4. 5. 6.

Campephagidae (cuckoo-shrikes)

113. *Coracina novaehollandiae* (black-faced cuckoo-shrike).
Source: (b). Status: Straggler. One recorded. Habitat?

Prunellidae

114. *Prunella modularis* (hedge sparrow).
Source: G.A.T. Status: Resident and breeding. Habitat 9B.

Muscicapidae (warblers, flycatchers, etc.)

Malurinae (Australian warblers)

115. *Gerygone igata* (grey warbler).
Source: G.A.T. Status: Resident and breeding. Habitat 9B.

Muscicapinae (flycatchers)

116. *Rhipidura fuliginosa* (fantail; pied and black phase).
Source: G.A.T. Status: Resident and breeding. Habitat 9B.

Turdinae (thrushes)

117. *Turdus philomelos* (song thrush).
Source: G.A.T. Status: Resident and breeding. Habitat 9B.

118. *Turdus merula* (blackbird).
Source: G.A.T. Status: Resident and breeding. Habitat 9B.

Zosteropidae (silvereyes)

119. *Zosterops lateralis* (silvereye).
Source: G.A.T. Status: Breeding. Habitat 9B.

Emberizidae (buntings etc.)

Emberizinae (buntings)

120. *Emberiza citrinella* (yellowhammer).
Source: G.A.T. Status: Resident and breeding. Habitat 1. 2. 3. 4. 5. 9.

121. *Emberiza cirlus* (cirl bunting).
Source: S.S., [Mar. 1969: 1]. Status: One record. Habitat ?

Fringillidae (finches)

Fringillinae (true finches)

122. *Fringilla coelebs* (chaffinch).
Source: G.A.T. Status: Resident and breeding. Habitat 1. 2. 3. 4. 5. 9B.

Carduelinae (greenfinch, goldfinch etc.)

123. *Carduelis carduelis* (goldfinch).
Source: G.A.T. Status: Resident and breeding. Habitat 1. 2. 3. 4. 5. 7. 9B.

124. *Acanthis flammea* (lesser redpoll).
Source: G.A.T. Status: Resident and breeding. Habitat 1. 2. 3. 4. 5. 7. 9B.

125. *Carduelis chloris* (greenfinch).
Source: G.A.T. Status: Resident and breeding. Habitat 9B.

Ploceidae (weavers)

Passerinae (sparrows)

126. *Passer domesticus* (house sparrow).
Source: G.A.T. Status: Resident and breeding. Habitat 1. 2. 3. 4. 5B. 6. 7B. 9B.

Sturnidae (starlings)

Sturninae

127. *Sturnus vulgaris* (starling).
Source: G.A.T. Status: Resident and breeding. Habitat 1B. 2B. 3. 4. 5B. 6. 7B. 8. 9B.

Cracticidae (bell magpies)

128. *Gymnorhina tibicen hypoleuca* (white-backed magpie).
Source: G.A.T. Status: Resident and breeding. Habitat 3. 5B. 9.

Corvidae (crows)

129. *Corvus frugilegus* (rook).
Source: Personal communications with farmers indicate that this species was occasionally sighted on cultivated ground on the western side of the Lake. None, however, have been sighted during this investigation. The disappearance of rooks is probably related to successful control measures first introduced in mid-Canterbury in 1945 (Williams 1969). During this period farmers considered the rook a serious pest. Status: No recent sightings. Habitat 5?

TABLE 2. CENSUS OF BIRDS RECORDED AT INTERVALS FROM 13 SEPTEMBER 1967 TO 26 FEBRUARY 1968 ON THE LAKESHORE AT KAITUNA, LAKE ELLESMERE

	September					October			November					December			February	Total times recorded	No. of birds
Date	13	19	20	27	29	7	26	27	2	3	22	23	26	6	9	21	26		
Birds recorded																			
1. Banded dotterel																3		1	3
2. White-throated shag											1							1	1
3. Yellowhammer		2																1	2
4. Canada goose															9		20	2	29
5. Chaffinch	4	4																2	8
6. White-faced heron							1									1		2	2
7. Starling									1							24		2	25
8. Black shag									1		1							2	2
9. Black-billed gull		2							1		1							3	4
10. Black-backed gull		2			3	2	2		1		2							6	12
11. Shoveler duck		3	2		14		4	8		2		11		32				8	76
12. Pied stilt	11	23	17	7			2	6					1	47		12		9	126
13. Black swan				5	7		21	23	23	42	22	4	6	4				10	157
14. Pukeko	5	5	5	11	19	6			3		1		1	9				10	65
15. Mallard		2	5	1	2	8	5	9	5	3	1			33				11	74
Number of species for each observation period	3	8	4	4	5	3	6	4	7	3	7	2	3	5	1*	4	1*		

* incomplete count

APPENDIX II

FREQUENCY OF OCCURRENCE AND ABUNDANCE OF BIRD SPECIES ON THE LAKESHORE AT KAITUNA

Between 13 September 1967 and 26 February 1968, from 0830 to 0845 hours, totals were kept of birds observed on 1.8 ha (4.5 acres) of squat saltmarsh vegetation (*Mimulus repens*, *Cotula coronopifolia*, *Lilaeopsis novaezelandiae*), 0.8 km (0.5 miles) offshore 172° 37'E - 43° 45'S from the site of the old Kaituna railway station (Fig. 2).

Observations were made using 16 x 50 binoculars from a 7.8 m (26 feet) tower constructed alongside the census area. Table 2 summarizes the data and shows that the most frequently recorded species (in ascending order) are: shoveler duck (*Anas rhynchotis*), pied stilt, black swan, pukeko and mallard. Totals for each species over the 15 complete observation periods show that the most abundant are black swan and pied stilt. Birds in the vicinity of the census area, but not shown in Table 2, included: paradise duck (*Tadorna variegata*), skylark, pipit, house sparrow, welcome swallow, caspian tern, red-billed gull (*Larus novaehollandiae*), eastern bar-tailed godwit, greenshank, pied oystercatcher, harrier hawk, rock pigeon (*Columba livia*), and native pigeon (*Hemiphaga novaeseelandiae*).

The census area chosen is subjected to frequent flooding and exposure. In general, a high lake level attracts a greater abundance and variety of waterfowl, and, occasionally, shag species. A freshly exposed lake bed is favoured by pukeko and pied stilt and to a lesser degree, mallard; but, with the withdrawal of water, black swan and particularly shoveler duck, decline in numbers. Early in December 1968, during a period of low water level, Canada geese were recorded. These probably represented birds from the South Island high country, which traditionally congregate on the Lake to moult in summer (Lamb 1964). Imber and William (1968), have estimated that perhaps half of the total South Island population of geese migrates to Ellesmere.